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SYMPOSIUM ON OIL POLLUTION, THE ENVIRONMENT, AND PUGET SOUND HELD AT SEATTLE, WASHINGTON, ON 23-24 FEBRUARY 1972

Neva L. Karrick, et al

National Marine Fisheries Service
Seattle, Washington

November 1972

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SYMPOSIUM ON OIL POLLUTION, THE ENVIRONMENT AND PUGET SOUND

23-24 February 1972
Olympic Hotel, Seattle, Washington

Sponsored by

Environmental Protection Agency
National Oceanic and Atmospheric Administration
Washington State Department of Ecology

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Northwest Fisheries Center
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
2725 Montlake Boulevard East
Seattle, Washington 98112

November 1972

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AGENDA

Wednesday, 23 February 1972

8:30 AM REGISTRATION

9:30 AM INTRODUCTION

GRIFFITH C. EVANS, JR., Executive Secretary
Oceanographic Commission of Washington

WELCOME

JAMES L. AGEE, Regional Administrator
Environmental Protection Agency

JOHN A. BIGGS, Director
Washington State Department of Ecology

DONALD R. JOHNSON, Regional Director, NMFS
National Oceanic and Atmospheric Administration

10:30 AM ENVIRONMENTAL FATE AND EFFECTS OF OIL POLLUTION

Moderator--HENRY F. DROEGE, Division Supervisor
Washington State Department of Ecology

"Petroleum Hydrocarbons and the Sea"
EDWARD E. DE NIKE, Chemist
(Presented by JOHN C. BERNHARDT, Aquatic Biologist)
Washington State Department of Ecology

"Puget Sound Hydrocarbon Baseline Study"
ROBERT C. CLARK, JR., Research Oceanographer, NMFS
National Oceanic and Atmospheric Administration

"Fate of Waste Oil in Puget Sound"
WARREN BENNETT, President
Lidcoa/Superior Refineries

12:00 Noon LUNCHEON--Spanish Ballroom

MC: JOHN A. BIGGS, Director
Washington State Department of Ecology

Speaker: SLADE GORTON, Attorney General
State of Washington

1:30 PM EFFECTS OF OIL POLLUTION IN PUGET SOUND

Moderator--JOHN B. GLUDE, Deputy Regional Director, NMFS
National Oceanic and Atmospheric Administration

"Texas Instrument Studies at Anacortes"
L. C. EHRSAM, JR., Fisheries Biologist
Texas Instruments, Inc.

"Biological Effect of Oil at Anacortes"
DR. MAX KATZ, Research Professor
University of Washington

"Development of an Environmental Damage Assessment Plan"
DR. HERBERT H. WEBBER, Associate Professor
Western Washington State College

3:00 PM CLEANUP TECHNIQUES IN PUGET SOUND

Moderator--HENRY D. VAN CLEAVE, Branch Chief
Environmental Protection Agency

"Cleanup Technology"
WARD H. SWIFT, Associate Manager
Pacific NW Laboratories, Batelle Memorial Institute

"Comparative Analysis of Cleanup Materials and
Equipment Available in Puget Sound"
BARRY J. PAULSEN, Administrative Engineer
Puget Sound Tug and Barge Co.

"Summary"
DR. JURIS VAGNERS, Assistant Professor
University of Washington

7:30 PM DINNER--Grand Ballroom

MC: GRIFFITH C. EVANS, Executive Secretary
Oceanographic Commission of Washington

Speaker: DR. DIXY LEE RAY, Director
Pacific Science Center

Thursday, 24 February 1972

9:15 AM INDUSTRY AND GOVERNMENTAL RESPONSIBILITIES AND ONGOING PROGRAMS

Moderator--JOHN J. VLASTELICIA, Division Director
Environmental Protection Agency

Panelists:

WESLEY A. HUNTER, Deputy Director
Washington State Department of Ecology

ROBERT S. BURD, Division Director, Region X
Environmental Protection Agency

REAR ADMIRAL JOSEPH J. McCLELLAND, Commander
13th Coast Guard District

DR. RICHARD L. LEHMAN, Senior Staff Scientist
National Oceanic and Atmospheric Administration

C. F. MILLER, Chairman
Washington State Oil Spill Cooperative

REAR ADMIRAL KENNETH A. AYERS, Executive Secretary
Northwest Towboat Association

12:00 NOON LUNCHEON--Grand Ballroom

MC: DR. DAYTON L. ALVERSON, Director
Northwest Fisheries Center, NMFS

Speaker: KEITH G. HAY, Wildlife Director
American Petroleum Institute

1:30 PM PUGET SOUND AND THE ALASKA OIL DEVELOPMENT

Moderator--RALPH J. STAEHLI, Manager, Puget Sound Sales
Foss Launch and Tug Co.

"Towards Assessing the Alaska Oil Impact on Puget Sound"
DR. STEVEN H. FLAJSER, Research Associate
University of Washington

"Projected Federal Legislation and Controls on Oil and Hazardous Materials"
KENNETH E. BIGLANE, Division Director
Environmental Protection Agency, Washington, D.C.

"Restructuring of State and Federal Government Processes"
DR. DONALD W. HOPPS, Executive Assistant
Puget Sound Governmental Conference

3:30 PM COORDINATED LOCAL OPERATIONAL ACTIVITIES, SUMMARY

Moderator--JAMES P. BEHLKE, Executive Assistant Director
Washington State Department of Ecology

Panelists:

DR. WALLACE G. HEATH, Director
Lummi Aquaculture Project

JAMES C. WILLMANN, Section Chief
Environmental Protection Agency

HARRY B. TRACY, Biologist
Washington State Department of Ecology

LCDR LOREN D. GORDON, Chief, Intelligence and Law Enforcement
13th Coast Guard District

W. JACK RACINE, Refinery Manager
Atlantic Richfield Company

BARRY J. PAULSEN, Administrative Engineer
Puget Sound Tug and Barge Company

* *

Chairman--JAMES C. WILLMANN
Environmental Protection Agency
206-442-1263/1264

Co-Chairman--HARRY B. TRACY
Department of Ecology
206-753-6880

Arrangements--ROBERT C. CLARK, JR.
National Oceanic and Atmospheric Administration
206-442-5569

INTRODUCTION

The "Symposium on Oil Pollution, the Environment, and Puget Sound" was sponsored by the Environmental Protection Agency (EPA), the National Marine Fisheries Service (NMFS) of the National Oceanic and Atmospheric Administration (NOAA), and the Washington State Department of Ecology (DOE). Approximately 450 people attended the symposium which was held at the Olympic Hotel, Seattle, Washington, on 23-24 February 1972. The steering committee members were Harry B. Tracy (DOE) and James C. Willmann (EPA), Co-chairmen, and Robert C. Clark, Jr. (NMFS).

The symposium was planned to encourage coordination of effort among private, State, and Federal agencies on potential problems arising from oil pollution in Puget Sound (Figure 1). Each agency presented a statement of what it considers to be the major problems and their possible solutions. Also presented were contingency plans being developed by the agencies for major and minor pollution incidents. The enforcement steps being taken were described as were measures to make them more effective. Research activities, current or planned, were outlined on establishing the baseline environmental data and minimizing the damaging effects of oil following an accident. As a first step in attaining the twin goals of improved communication and coordination of effort among the numerous agencies responsible for minimizing oil pollution in Puget Sound, the symposium was a success.

The symposium originally was to be a vehicle for informal exchange of information among the groups working on oil pollution. Formal papers, therefore, were not requested from participants. When the symposium expanded in scope, however, it was decided that a written record should be available, and preparation of summaries of the sessions was assigned to personnel from the sponsoring agencies. These summaries form the basis for this report.

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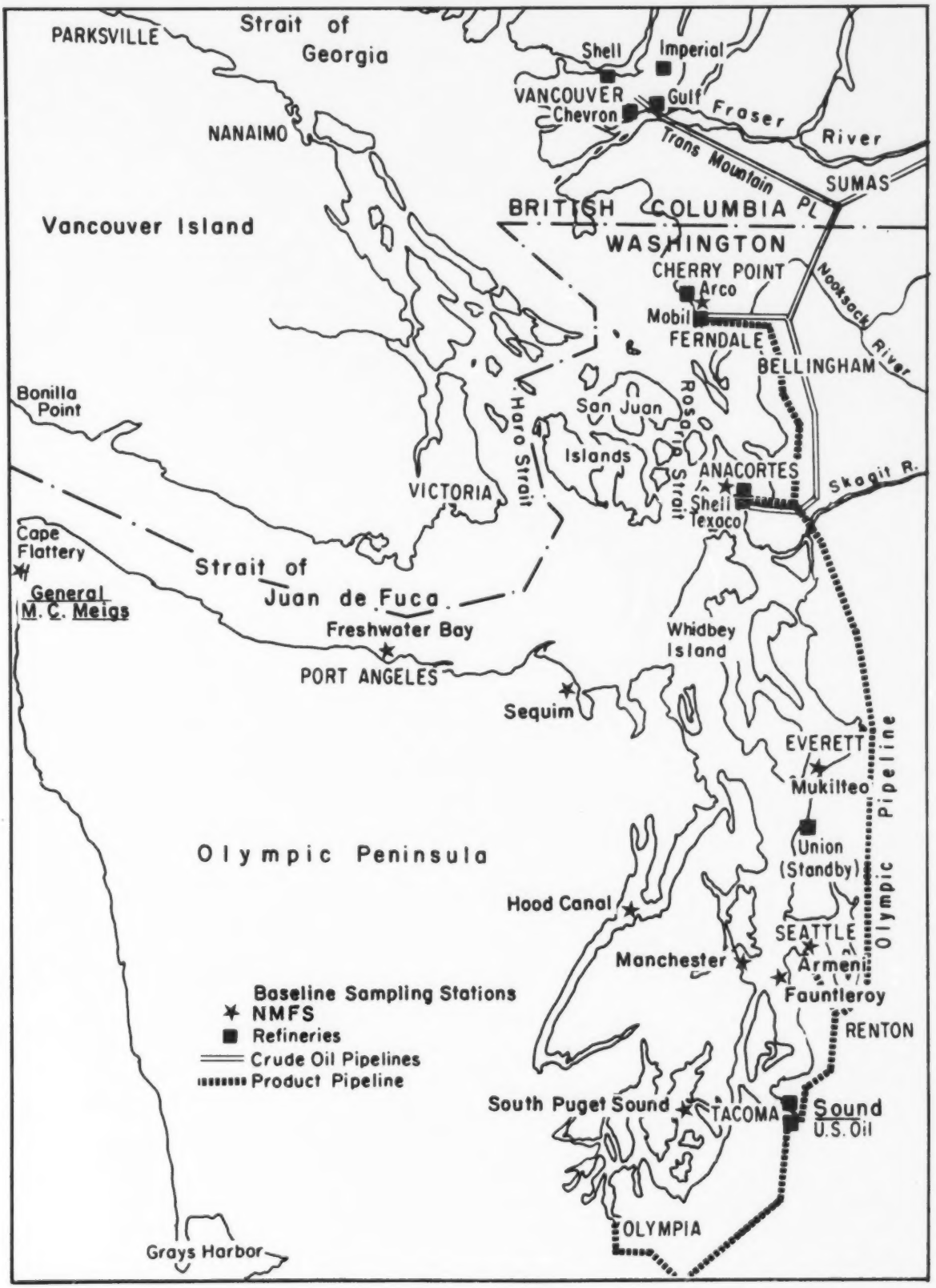

Figure 1.—Map of the Greater Puget Sound Basin showing major oil refineries and Hydrocarbon Baseline Sampling Stations (NMFS).

REPORTS OF SECTIONS

Section I. Environmental Fate and Effects of Oil Pollution
(10:30 AM, Wednesday, 23 February 1972)

Moderator: HENRY F. DROEGE
Division Supervisor, Technical Services
Department of Ecology
State of Washington
Olympia, Washington

Rapporteur: GEORGE R. SNYDER
Fishery Biologist
Northwest Fisheries Center
National Marine Fisheries Service
Seattle, Washington

1. PETROLEUM HYDROCARBONS AND THE SEA

by

EDWARD E. DE NIKE
Chemist
Department of Ecology
State of Washington
Olympia, Washington

presented by

JOHN C. BERNHARDT
Aquatic Biologist
Department of Ecology
State of Washington
Olympia, Washington

Due to increased production and marine transport of petroleum, spills on the ocean are increasing at an alarming rate. Within the last few years innumerable small and large spills have occurred, three of which have been documented sufficiently to provide a history of damage to marine life. Sound long-range predictions of the effects that oil may have on the marine ecosystem are hindered by the complex and variable nature and behavior of petroleum hydrocarbons, the intricate interrelationship and adaptive capacity of marine organisms, and the different geographical, meteorological, and geological conditions of the site.

Crude petroleum can be broken down into three main groups according to structural predominance: aromatic, naphthenic, and paraffinic. The aromatics often have higher sulfur content and are least volatile and generally more toxic. Naphthenics are intermediate and more easily degraded in sea water. Paraffinics are lighter and least toxic.

Most oil spills involve fuels. Heating oils are divided into six main groups--from No. 1, which is an exclusive home heater, to No. 6, which is a viscous residual oil. Diesel oil is a special purpose fuel possessing, in some cases, components of crudes or even residuals. Toxicity seems to be proportional to volatility and aromaticity--on this basis No. 1 and No. 2 fuels would be most toxic. Unused petroleum lubricating oils most probably have low toxicity, but waste lube oils subjected to high heat and engine wastes have a much higher toxicity.

The solubility of petroleum hydrocarbons in sea water is low. Solubility of paraffins appears to decrease by a factor of 10 for every three carbons added. Evaporation plays the largest role in reducing the volume of crude oil and distillate spills--70% can evaporate within a few days.

Oxidation of petroleum is complex. When oxygen is available and inhibitors are absent the reaction is rapid. All hydrocarbons are susceptible to microbial oxidation, but no single species is capable of oxidizing all hydrocarbons. Over 100 species of bacteria, yeasts, and fungi have been found which accomplish microbial oxidation of hydrocarbons. Molecular configuration seems to be the most important factor in selective biodegradation. Temperature, trace elements, and pH should be optimum for rapid breakdown.

In the last 60 years many spills have occurred, but lack of documentation and damage asssessment have rendered them historically unappraisable. Three spills are noteworthy, however:

1. The Torrey Canyon spill in March 1967 released 15-29 million gallons of crude oil into the sea--vast quantities were washed up on the shores of England and France. Nearly 2 million gallons of emulsifier were used in an attempt to disperse this oil. The toxic effect of the detergent/emulsifiers matched and surpassed the toxicity of the oil. Direct toxicity of the emulsifiers was demonstrated in copepods and in larvae of barnacles, oysters, clams, snails, sole, and plaice. Very young fish and floating fish eggs were destroyed. Investigations performed 18 months after the spill demonstrated complete recolonization of many communities with the rest well on their way, but little data were available on higher animal forms.

2. The Santa Barbara Blowout occurred in January 1969 and released about 30 million gallons of aromatic based crude oil into coastal waters. Prevailing winds held the oil at sea for several days before allowing it to drift to shore. The notable feature of this spill was the lack of damage to the marine organisms. Birds suffered real damage--kill was high on aquatic species. It was estimated that survival of the birds collected was only 12%. Cleanup of shores and water consisted mostly of absorption of oil by straw.

3. In September 1969, a fuel barge ruptured her hull on storm-lashed, submerged rocks off West Falmouth, Mass., spilling 185,000 gallons of No. 2 fuel oil into coastal waters. An excellent biological and chemical study was performed by Max Blumer and collaborators from the Woods Hole Oceanographic Institution. The fuel oil was described as a fairly soluble and highly toxic material. Estimates placed 95% of the marine animals as dead or dying. The oil spread to an area 10 times the area of initial contamination. Chromatograms demonstrated a slow rate of biodegradation of the oil in the water as well as a persistence of hydrocarbons in shellfish tissue, suggesting a long period of destruction to commercial shellfish productivity. The affected area had not been repopulated 9 months after the accident.

Petroleum hydrocarbons are very complex chemicals. Fuels are probably the most important in relation to spills at sea. Petroleum production and transport at sea is increasing as is the incidence of spills on the ocean. Over a period of time, this persistent pollution could interfere with the life processes of marine organisms.

2. PUGET SOUND HYDROCARBON BASELINE STUDY

by

ROBERT C. CLARK, JR.
Research Oceanographer
Northwest Fisheries Center
National Marine Fisheries Service
Seattle, Washington

The National Marine Fisheries Service (NMFS) has a responsibility for the preservation and enhancement of the living marine resources. Oil is a chemical which has biological ramifications when spilled in the marine environment. Any research into the marine effects of oil pollution must therefore combine chemical and biological studies. The NMFS Puget Sound baseline study of hydrocarbons is one example of the application of modern chemical analytical techniques to the problem.

The NMFS Northwest Fisheries Center in Seattle began oil pollution studies several years ago. Initial efforts at Manchester, Washington, indicated that oil spills could have a detrimental effect on saltwater salmon aquaculture. A preliminary marine transportation study indicated the volume of petroleum moved into the Greater Puget Sound Basin to be of the order of 260,000 barrels per day in 1970, of which less than 20,000 b/d was crude oil. Potentially, a large increase could enter from Alaska's North Slope when and if the Trans-Alaska pipeline is completed. Present NMFS studies are designed to establish a baseline or "before" picture of oil pollution in Puget Sound.

(A slide program was presented at this point. A brief and general description of the slide program follows:)

Slide 1--Map of the Greater Puget Sound Basin with the 10 sampling stations of the baseline study--three marine laboratory sites are used as stations including NMFS stations (Mukilteo and Manchester) and the Battelle Northwest Laboratory at Sequim. Stations with no known sources of low-level pollution are located in South Puget Sound, Hood Canal, and Freshwater Bay. An intermediate station is in Central Puget Sound at Fauntleroy.

The industrial-commmercial stations are at Armeni, Anacortes, and Cherry Point. Additional effort is being expended at the site of the grounding of the troopship General M. C. Meigs in cooperation with the Environmental Protection Agency and the Department of Ecology.

Slide 2--Method of baseline study. The petroleum hydrocarbons are readily separated from marine organisms and easily identified by existing chemical techniques. It is, however, necessary to determine the natural or biogenic hydrocarbon baseline for marine organisms to see the effects of pollution. Chromatographic identifications of straight-chain hydrocarbons were well illustrated in this figure. It was pointed out that normal paraffin hydrocarbons are used as an indication of a greater pollution problem by comparing the content and pattern (fingerprints) of organisms from polluted vs unpolluted waters (areas). Biogenic hydrocarbon patterns usually display an odd-carbon number predominance (for example, C_{15} or C_{17} vs C_{16} or C_{18}), whereas petroleum usually has no odd or even carbon predominance.

Slide 3--Four basic steps were described for isolating and identifying the natural hydrocarbons:

1. Collection and preservation of samples without contamination.
2. Extraction of organic matter from cellular matter.
3. Separation of saturated hydrocarbon from total organic extract.
4. Basic chromatographic identification.

(This process is time consuming because each sample takes about 10 days to analyze.)

Slides 4, 5, 6--Laboratory gear and techniques. Soxhlet extraction apparatus which is used to separate organic matter from cellular matrix (using solvents). Bulk solvent is evaporated off and concentrate is preserved. The highly colored extract is then chromatographed (with silica gel and alumina columns).

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Slide 7--Final result is shown on graph from potentiometric strip chart recorder (off the gas chromatograph) which yields series of straight-chain hydrocarbon spikes. The order of peaks is related to the boiling point of the hydrocarbon and appears in a uniform fashion for the normal paraffins. A biogenic hydrocarbon sample was compared to a petroleum sample. Petroleum hydrocarbons show no odd-even carbon predominance and a smooth envelope of peaks. Pollution peaks superimpose over biogenic hydrocarbon peaks at a much higher level.

Slide 8--Patterns of common bay mussels: one exposed to petroleum pollution, one not exposed. Both samples displayed similar background patterns but mussel exposed to petroleum pollution had high hydrocarbon content with no odd-even predominance. Emphasis was again directed to the fact that biogenic hydrocarbons have predominantly odd carbons and that lack of predominance can indicate petroleum compounds.

Slide 9--Common bay mussel pattern "fingerprint" with pattern of No. 2 fuel oil superimposed. It was pointed out that individual hydrocarbon contents that agree within 75% are good, considering normal biological variations. The smooth distribution of the normal hydrocarbon peak envelope for fuel oil was pointed out. The pattern of the bay mussel which had been exposed to the No. 2 fuel oil matched with the fuel oil pattern.

Slides 10-16--Various carbon chain patterns for mussels, exposed or not exposed to various types of petroleum, and the comparative relationships. Different petroleum products gave different patterns. Experiments of controlled exposure of hydrocarbons to organisms in the laboratory were illustrated.

Conclusions:

1. Chemical techniques for the analysis of hydrocarbons are available but time consuming.

2. Definite differences exist between biogenic and pollution hydrocarbons that can be measured in marine organisms.

3. We can find real differences in hydrocarbon patterns of organisms from polluted and unpolluted waters, although more research must be conducted in areas of low-level pollution.

4. We can detect bulk differences in petroleum sources.

5. NMFS is conducting baseline studies in the Greater Puget Sound area but at a low level of effort--this effort needs to be accelerated. Other analyses are being made by NMFS of organisms in the Prince William Sound and Arctic Ocean areas in cooperation with other concerned agencies.

6. The techniques described provide one method of determining the chemical uptake of hydrocarbon pollution by marine organisms in the Greater Puget Sound Basin.

3. FATE OF WASTE OIL IN PUGET SOUND

by

WARREN BENNETT, President
Lidcoa/Superior Refineries
Woodinville, Washington

As early as 1910, oil was an environmental problem. In Chicago, street drains were used to get rid of waste oil from automobile crankcases. The oil went into the Chicago River which empties into the Mississippi. The first real solution to the oil disposal problem came in 1915, when a refinery was built to reclaim and recycle used oil.

Oil recycling came to the Northwest in 1934 when a Superior Refinery was built in Lake City, at that time a suburb of Seattle, Washington. Fifteen years ago, the company moved its operations to Woodinville, Washington.

Over 6 million gallons of crankcase oil drainings are taken from Washington State cars and trucks each year. Something must be done with this oil and Superior Refineries provides an alternative to the indiscriminate dumping of waste oil into our waterways.

The wastes from crankcase drainings are taken to the Woodinville Plant where the oil is re-refined to produce a variety of petroleum products. Everything is used, thereby keeping our waters clear, clean, and fresh.

METRO (sewage treatment agency for the Municipality of Metropolitan Seattle) is enthusiastic about the efforts being made by Superior in the recycling of waste oil. Allan L. Poole, industrial waste engineer for METRO recently said, "Except for the efforts of Superior Refineries (LIDCOA) in reclaiming waste crankcase oils, we'd have a potential for collapse of our entire system. Though dumping oil into sewers is illegal and severely penalized, policing all 1,100 service stations in the Seattle area is impossible...." Oil that reaches the treatment plant at METRO actually stops the biological treatment process.

Superior Refineries is currently making arrangements with service stations in the Puget Sound area to offer recycling centers (dumping facilities) for do-it-yourselfers to dispose of waste oil.

Mr. Bennett suggested that the public recognize the service that recycling refineries provide and that it is helping in the problem of illegitimate crankcase oil disposal. It was also pointed out that 6 million gallons of crankcase oil that Washington State cars and trucks use and dispose of each year is the equivalent of a T-2 tanker load.

DISCUSSION

Robert Clark was asked how many replicates were run in the NMFS laboratory studies that were conducted and if controls were used. Mr. Clark indicated that in the laboratory bioassays, controls were used and that several replicates were done. The study involved experimental tidal-cycle exposure (in the laboratory) of mussels to various petroleum hydrocarbons. Exposed organisms were compared to control mussels.

Regarding the number of gallons of oil involved in the West Falmouth spill and the Anacortes spill, the reply was given that about 180,000 gallons were spilled at West Falmouth and approximately 230,000 gallons at Anacortes.

As to the work being conducted by NMFS relating to effects of oil spills, the answer was that NMFS is establishing background information on a few common species of marine organisms to establish levels of hydrocarbon that exist at a given time. Although the work is being funded at a low level, some basic results can be obtained. NMFS, however, is measuring contamination of fairly resistant species and it is possible that some organisms have already been eliminated by low-level hydrocarbon pollution.

Mr. Clark was asked, "Are carbon 14 ratios being determined in your studies?" He replied, "No."

Mr. Bennett was asked, "Where does waste oil come from?" He replied, "From service stations in Western Washington, primarily because 70% of the stations are located in that area; Superior Refineries is picking oil up from 35% of the stations." He pointed out that some organizations are selling the waste oil for burnable fuels and that other oil is indiscriminately wasted or disposed of. He indicated that a problem had been caused in the University area of Seattle by indiscriminate dumping of waste oil down storm sewers that eventually reached the METRO plant. He added that a new program has been initiated that will make facilities available at over 250 stations for public disposal of waste crankcase oil.

To the question "Can dispersants be used in the State of Washington?"--the reply was that there were no regulatory people on the panel and the question was only answered in general. Although dispersants do remove the surface film they distribute the petroleum throughout the system. Thus the dispersant is united to the oil in the entire water mass and in general this increases the magnitude of the toxicity.

Mr. Bennett was asked if there was a sludge residual from the re-processing of oil. He replied affirmatively, that in general they are burned and that new technology is being applied to this problem.

To the question "Were the studies that were conducted at the Santa Barbara Oil Spill adequate?" the reply was that items that appear in the 900-page report were not included in the abstract and conclusion section of the report. This tends to "color" the results somewhat. In general, some experimental findings were similar to the "Blumer Report" but this was not emphasized. It was suggested that a little more chemistry could have been added to the biological studies.

To "Are there attempts being made to establish some type of criteria or legitimate survey procedure for oil spill investigations?" the answer was "Yes, attempts are being made by EPA to establish some guidelines. Cooperative work will help, but it appears that it will take several years to complete the job."

Mr. Clark was asked to give a general description of the total sampling program NMFS is conducting. He indicated that the sites were selected after very careful research into the matter plus some personal preference and his own background of experience in this subject. He suggested that sampling areas were restricted to those containing intertidal organisms that were readily available at all sites and that exacting care was taken at all times in the collection and preservation of the organisms to eliminate outside contamination.

Section II. Effects of Oil Pollution in Puget Sound
(1:30 PM, Wednesday, 23 February 1972)

Moderator: JOHN B. GLUDE, Deputy Regional Director
Pacific Northwest Region
National Marine Fisheries Service
Seattle, Washington

Rapporteur: NEVA L. KARRICK
Research Chemist
Northwest Fisheries Center
National Marine Fisheries Service
Seattle, Washington

A. INTRODUCTORY REMARKS

by

JOHN B. GLUDE
Moderator

Puget Sound has 2,500 square miles of surface area and 2,160 miles of coastline, which is more coastline than the rest of the Pacific Coast of the United States exclusive of Alaska. The complexity of this basin makes it difficult to describe its hydrographic conditions in average terms.

The largest oil spill in Puget Sound occurred on 20 July 1969, when a barge sank in Admiralty Inlet with 13,500 barrels of oil, which were released gradually over a 4-month period. The second largest spill was about 5,500 barrels on 25 April 1971 in Guemes Channel near Anacortes. For comparison, if the Torrey Canyon spill of 15-29 million gallons had occurred in Puget Sound, 88 miles of beach 100 yards wide would have been covered with 1 inch of oil, shellfish would have been tainted, and fishing operations would have been harmed.

Few studies concerning the biological effects from oil in Puget Sound have been made except for those following the 1971 spill at Anacortes.

Most previous observations on effects of oil spills have been superficial. We hope that new approaches, such as those used by Dr. Blumer and his associates at West Falmouth, Mass., will provide more detailed and meaningful information.

Following are discussions of studies on three aspects of the most completely documented oil spill in Puget Sound, that which occurred in Guemes Channel near Anacortes in April 1971.

5. TEXAS INSTRUMENT (TI) STUDIES AT ANACORTES

by

L. C. EHRSAM, JR.
Fisheries Biologist
Environmental Services
Texas Instruments, Inc.
Dallas, Texas

As a result of the 25 April 1971 spill of 260,000 gallons of No. 2 diesel oil at March Point, Anacortes, a TI team under contract with EPA was activated on 3 May for the Phase I Study designed to (1) gather information on the spill's damage to biological communities, (2) determine hydrocarbon content of the water, sediments, and organisms, and (3) review the literature on the tides and tidal-current regime in the vicinity of the spill. The survey for Phase II was conducted from 3 August to 4 September 1971 to (1) determine biological effects, if any, after 3-4 months, (2) measure any persistent hydrocarbon content in the sediments, and (3) detect possible recovery of biological communities after the spill. Phase II also included tests for acute toxicity of No. 2 diesel oil on various organisms, herbivores, scavengers, and predators.

Experimental Procedures

Biological sampling was done on 18 traverses perpendicular to shoreline from the upper intertidal to below 10 meters in the subtidal regions located as follows:

(1) South shore of Guemes Island (6 traverses), which received the full impact of the spill

(2) Huckleberry, Saddlebag, and Hat Islands (1 traverse each)

(3) Deer Point on Orcas Island (3 traverses), which was the control

(4) Padilla Bay, 1/2-mile south of March Point (1 traverse), which was the area for the 1958 baseline study (Sylvester and Clogston, 1958, University of Washington Report, Department of Civil Engineering)

(5) Padilla Bay (3 traverses)

(6) Lummi Island (2 traverses)

Phase II Sampling, Guemes Island and Adjacent Areas

Hydrocarbon analyses.--Water, sediment, and biological samples were taken at each station for hydrocarbon analyses by temperature-programmed gas chromatography.

Acute and static toxicity bioassays.--Recommended standard procedures were used (Doudoroff et al., 1951, Sewage and industrial wastes, 23 (11): 1380-1397; and American Public Health Association, Standard methods, 1971). Test animals were limpets, wrinkled purple snails, mussels, shorecrabs, amphipods, mysids, starfish, and sculpins.

Effects of Spill

An immediate effect was the loss of about 350 waterfowl along the south shore of Guemes Island and the north shore of Fidalgo Island. Other groups of observers noticed some mortality in all organisms along the south shore of Guemes Island, with greatest mortality in chitons, limpets, and cockles. Observations included oil exuding from rocks and sediment on Guemes and Saddlebag Islands, snails that appeared narcotized in areas where greatest amounts of oil residue were observed, and large numbers of dead small crabs on the south shore of Guemes Island.

Direct comparisons between the 1958 and 1971 surveys could be made only on the kinds of animals present and were of relatively little value in this study. However, there was a greater diversity of animals in 1971 than in 1958. The Phase II study indicated that several groups of organisms had suffered severe mortalities as no tellinid clams and almost no Acmea (limpets) were found on two transects on Guemes Island. Hydrocarbon analyses from Phase II showed measurable oil residue still on the south shore of Guemes and on Huckleberry Islands.

Bioassays to determine acute toxicity supplemented available data on the effects of refined petroleum products on certain marine animals, but extrapolating bioassay data to field conditions has limitations because neither the effects of emulsified oil nor effects of direct physical contact of the oil on these animals were studied.

Substantial mortality of limpets resulting from the spill of diesel oil was reported, and the bioassays showed that limpets were the second most sensitive of the species studied. Many dead shore crabs were observed after the spill, but similar crabs were tolerant of oil in the bioassay. If the crabs were killed by the oil, mortalities may have been caused by physical contact with the oil. If larval or juvenile forms were killed, the full impact of the spill may not be known for at least a year after the spill.

6. BIOLOGICAL EFFECTS OF OIL AT ANACORTES

by

DR. MAX KATZ
Research Professor
College of Fisheries
University of Washington
Seattle, Washington

(This study of the oil spill was done by Dr. Katz as a private consultant.)

Standard techniques for study of beaches are available; results from this study parallel those obtained in other studies. One problem is how to evaluate damage to marine and littoral organisms. This problem would have been simpler if a major commercial fishery operated near Guemes Channel. The crab fishery has been declining for 5 years. The present state of knowledge precludes plankton being used as indicative of damage. There was no evidence of damage to fish.

Resident organisms in intertidal zones are most likely to give significant data, although it is difficult to determine if mortality is caused by oil or by other causes, such as natural mortality or predation by people or other animals. A similar beach with similar conditions must be used as control.

The study on Guemes Island was started 2 weeks after the spill. Four transects on different types of beach affected by the spill were sampled from high tide to minus tide. A beach to the west that was apparently unaffected by the spill was used as a control. Organisms were counted and collected on surfaces above and below stones and to depth of 10 inches. Organisms were taken to the laboratory where they were identified, counted, and measured. Rechecks were done with a 15-inch shovel survey. Samples at the same stations were taken in May, June, and September 1971 and in February 1972.

A biological desert was not created by the spill. There were significant mortalities of organisms, but these have been replaced and many organisms survived with no apparent harm. Effects of the spill were minor and no long term effects are likely.

Comments by Dr. Herbert Webber--He agreed with Dr. Katz on the general state of affairs from the Anacortes spill but pointed out that we do not know if there will be adverse long term effects. Certainly mortality was great immediately after the spill, but the dead organisms would have been washed away before Dr. Katz made his observations 2 weeks later. Furthermore, Dr. Katz's work was based only on intertidal organisms and the conclusions can relate only to them. Interpolation to other organisms cannot and should not be made. The intertidal organisms live under conditions of tremendous stress and therefore are among the hardiest and most resistant of any plants or animals. We do not know whether there were effects on subtidal and benthic organisms or if larvae and juveniles were killed.

7. DEVELOPMENT OF AN ENVIRONMENTAL DAMAGE ASSESSMENT PLAN

by

DR. HERBERT H. WEBBER
Associate Professor
Huxley College of Environmental Studies
Western Washington State College
Bellingham, Washington

In Washington the spiller of oil is liable for all damages, not just the immediate lethal effects. For this reason, we must be able to measure damage to the environment and know what happens to the ecology of a spill area. Contingency plans focus on cleanup, not on biological damage. We must be able to measure this damage and agree on methods used to do so. A method of mortality assessment is proposed below and feedback on the method and its feasibility is wanted.

There are a number of possible approaches to a damage survey. The optimum would be a detailed analysis the day before a spill, but this is obviously impractical. Since potential spill locations are almost infinite, it is impossible to get base line information on all of them. Even if a few sites could be located, continual background monitoring would be necessary to account for seasonal and other natural changes.

The difficulty of utilizing studies on areas before industrialization was shown by comparison of the Texas Instrument survey with earlier surveys in the area. Techniques were different and results were different as indicated by the fact that larger number of organisms were collected in 1971 than in the background studies in 1958. Furthermore, effects of seasonal or other natural change in species composition could not be evaluated.

A third method involves indices of diversity, i.e., the ratio of one species to another. This is an experimental procedure about which biologists disagree and is not of practical value.

The method proposed here is based on assessment of mortality after a spill. Sampling must be done immediately and must be large. Usually about 24 hours elapse before mortality is great. A large amount of manpower is needed to count organisms as they die.

There are several important aspects to the method: (1) How do you decide when to do a mortality survey? The location of the spill and the quality and quantity of oil are important considerations. Criteria for the need to determine biological effects are not the same as for aesthetic damage. Crude oil has the highest potential danger from an aesthetic standpoint but the potential for biological damage is greatest from lighter, more volatile oils, which are generally more toxic. (4) What should be measured? Consistency of measurements is required. Analyses should be made of (a) initial mortality, (b) persistent mortality, (c) recovery rate of affected areas, (d) dispersion and solubility of the oil in seawater, (e) oil entrainment in substrates, and (f) accumulation of hydrocarbons in organisms.

Initial mortality would be determined during 2-3 days immediately after the spill by quantitative sampling of the intertidal zone and qualitative sampling of benthos and plankton. Beach surveys would note mortality, especially of birds. Details of sampling should be given for intertidal and subtidal zones and for plankton. Sediments and water samples would be analyzed for hydrocarbons.

Persistent mortality is important to determine because mortality in some organisms begins 10-14 days after the spill. Repeated sampling areas should be located as close as possible to the original sampling areas. The timing would depend on results from the spill. Again it is important to look at more than the intertidal zones and to learn what is happening below the surface of the waters to the benthic organisms and to the hydrocarbon content of water, sediment, and animal tissues.

Complete recovery is difficult to measure because of lack of a rigorous control, but rates of recruitment can offer a measurement. These studies would start after the mortality rate has become minimal. Population densities along transect lines then would be determined and periodic checks would be made to determine adult immigration and larval recruitment.

The major problem in providing manpower is logistics. Dr. Webber suggests that the Department of Ecology provide a coordinator (1) to contact people who can and will participate, (2) to organize the work, (3) to furnish a sampling plan, and (4) to maintain a roster of available personnel. The State Coordinator would use the data collected to prepare a report on the spill.

Funds will be needed to hire boats and to reimburse people who have to travel any distance. Many people will participate in a disaster project for little or no reimbursement. Necessary funds might come from a source such as the Coastal Contingency Fund.

When spills are small, damage assessment can be handled by personnel of governmental agencies. This plan is suggested to assess damage during spills in the category of "major disasters."

DISCUSSION

Capt. Koenig (13th Naval District) asked, "What damage resulted from the Anacortes spill? The reports appear to be contradictory." Dr. Katz replied that he does not think that there will be a long lasting damage. Even with the Torrey Canyon incident, which was a much larger spill, there appears to be no long term problem.

Dr. Webber pointed out that Dr. Katz "thinks" but does not "know" that effects were negligible. Only a little wedge was looked at and we don't know whether there were other effects. Damage probably was minimal, but we don't know. We must get the necessary knowledge.

L. Ehrsam said that evidence from Phase II indicates that damage was not lasting but we do not know whether there are long term effects.

John Glude said that because the oil spills he has seen have not been in areas important to commercial fisheries, their effects are difficult to estimate. He has reservations about the superficial approaches of the past. Max Blumer, in his studies after the Falmouth spill, detected the presence of petroleum hydrocarbons months after odor and visible evidence of the oil spill had disappeared. No one knows what this evidence signifies.

Ernest W. Limbacher (Puget Sound Gillnetters Assoc.) asked why the crab fishery has declined and stated that crab fishermen attribute it to effluent from the oil refineries.

Dr. Katz replied that the crab fishery has been declining for 5 years and that no one knows the reason.

Robert Gay (Federation of Fishermen) asked about the effects of oil on downstream fish migrants. What if a spill occurred at a critical time when the fish were present? How can you detect if they are killed?

Dr. Webber said that reports in the literature have stated that oil smothers fish. Lethal effects have been noted from 1 teaspoon in 1 quart of water.

John Glude noted that at the NMFS Aquaculture Facility at Manchester the salmon stop feeding if there is oil on the surface. He concluded the session by emphasizing that this session had contributed to the objective of the meeting which was to disseminate information on which to base decisions about what we can do to protect Puget Sound and its resources.

Section III. Cleanup Techniques in Puget Sound
(3:00 PM, Wednesday, 23 February 1972)

Moderator: HENRY D. VAN CLEAVE
Chief, Oil Branch
Environmental Protection Agency
Washington, D.C.

Rapporteur: CARL H. ELLING
Assistant Division Director
Division of Coastal Zone and Estuarine Studies
Northwest Fisheries Center
National Marine Fisheries Service
Seattle, Washington

8. CLEANUP TECHNOLOGY

by

WARD H. SWIFT, Associate Manager
Water and Land Resources Department
Pacific Northwest Laboratories, Battelle Memorial Institute
Richland, Washington

Broad aspects of cleanup "technology" were presented. Many complications combine to make oil cleanup an extremely difficult task. The spills are always unexpected; they can occur anywhere anytime; they vary in density; and are seldom predictable in terms of shape. Water currents and degree of roughness of the water surface further complicate the job. It can be generally concluded that no effective means exists for cleanup of open water or offshore spills. Cleanup methods have included the use of absorbents, booms, skimmers, sinking agents, dispersants (with their consequences of biodegradation), burning, gelling agents, biological attack (has potential, but is by no means effectively developed at this time), and bubble barriers. Adequate shore and beach cleanups have been accomplished but with tremendous effort. Disposal of oil wastes deposited on shore has been a real problem--burning or land fill are most commonly used. Mr. Swift concluded that cleanup technology still has a long way to go.

9. COMPARATIVE ANALYSIS OF CLEANUP MATERIALS AND EQUIPMENT AVAILABLE IN PUGET SOUND AREA

by

BARRY J. PAULSEN
MOPS Coordinator
Marine Oil Pick-up Service
Seattle, Washington

Specifics of cleanup equipment on hand or to be available shortly in Puget Sound were related. On the surface the listing was impressive. A number of privately-operated "boom and skimmer fleets" are taking shape and will be available on a 24-hour basis in various sections of the Sound. The U.S. Navy is also gearing up for extensive oil cleanup operations. Preparations at Manchester, Bremerton, and elsewhere were noted. Brief comparisons of cleanup methodology were made in view of special problems in Puget Sound (peculiar choppy wave action and 12-foot tidal changes with associated rapid flows). Skimming and removal of oil by vacuum heads, continuous belts, or absorbents are being favored over use of dispersants. Summation--"We have come a long way but are not there yet."

10. SUMMARY

by

DR. JURIS VAGNERS, Associate Professor
Department of Aeronautics and Astronautics
University of Washington
Seattle, Washington

Response capabilities in Puget Sound were considered--"Where are we? Where are the holes?" Indications are that contingency planning and coordination anre excellent on paper, but without the experience of a "fire drill" we can never be completely certain of our capabilities. We are apparently reasonably well prepared to cope with small spills in local harbors, but even under these limited circumstances, we need to know the depths at which cleanup equipment can operate. Many shallow lagoons and bays may preclude use of boom and skimmer rigs.

Criteria for assessment of pollution apparently are not well defined. What are the acceptable levels? Are numbers (of organisms) killed really the final determination of damage? What about the long term effects on organisms (mutations)?

Dr. Vagners concluded that an independent panel (free of financial involvement in oil spills) should be established to provide technical and scientific critique on what is needed.

DISCUSSION

A discussion followed presentations by the speakers.

Section IV. Panel--Industry and Governmental Responsibilities and Ongoing Programs

(9:15 AM, Thursday, 24 February 1972)

Moderator: JOHN J. VLASTELICIA
Director, Enforcement Division
Environmental Protection Agency
Seattle, Washington

Rapporteurs: HARRY B. TRACY, Biologist, and
JOHN C. BERNHARDT, Aquatic Biologist
Washington Department of Ecology
Olympia, Washington

Panelists:

11. WESLEY A. HUNTER
Deputy Director
Washington Department of Ecology
Olympia, Washington

12. ROBERT S. BURD
Director, Air and Water Programs
Environmental Protection Agency
Seattle, Washington

13. REAR ADMIRAL JOSEPH J. McCLELLAND
Commander, 13th Coast Guard District
Seattle, Washington

14. DR. RICHARD L. LEHMAN
Senior Staff Scientist
National Oceanic and Atmospheric Administration
Washington, D.C.

15. C. F. MILLER
Chairman
Washington State Oil Spill Cooperative
Ferndale, Washington

16. REAR ADMIRAL KENNETH A. AYERS
Executive Secretary
Northwest Towboat Association
Seattle, Washington

11. During the first presentation, MR. WESLEY A. HUNTER, Deputy Director, Washington State Department of Ecology, provided a "brief resume of the Washington State Oil Spill Action Plan" while showing the table of contents of the Plan on the overhead projector:

The Federal Oil and Hazardous Materials Pollution Contingency Plan published under provision of the Water Quality Improvement Act of 1970 states "the policy of the federal government is to take corrective action only for

those spills that are beyond the capability of the state and local governments and private parties concerned." Furthermore, the federal plan is applicable only to navigable waters, which leaves many lakes and streams in Washington unprotected on the federal level.

The people of Washington State insist on complete coverage in oil spill emergencies and they look to the Washington Department of Ecology (WDE) to provide this service. Although this Action Plan is founded on interagency cooperation, neither the people of Washington nor the WDE intend to be totally dependent upon another agency for policing oil spills that occur in Washington State waters. The Washington Department of Ecology assumes prime responsibility for oil spill prevention and control in the waters of Washington State. The purpose of the State Oil Spill Action Plan is to provide guidelines for a coordinated and integrated response of the WDE and other state agencies to all oil spill emergencies that occur in any waters of Washington State. The objectives of the Plan are to provide an efficient means of reporting oil spills, to implement an interagency notification network, and to provide a series of other services with regard to oil pollution abatement.

The Oil Spill Action Plan is effective in all inter- and intrastate waters of Washington. It provides for protection against oil pollution of "waters of the State" as defined by Chapter 90.48.020 RCW. Also protected by this plan are any adjacent lands, offshore waters, surface waters, or ground waters where a petroleum byproducts spill may present a threat to any waters of the state.

Basically, cleanup is funded by the identified spiller in accordance with Chapter 90.48 RCW. In the event the identity of the spiller is unknown, or he is unwilling or unable to fund the removal of spilled oil, cleanup costs will be paid from the Coastal Protection Fund within the limits of its capability. Whenever it is apparent that the cleanup cost will overburden the financial capability of the Coastal Protection Fund, federal assistance will be requested through the United States Coast Guard or the Environmental Protection Agency.

Under state policy and authority, it is declared to be the public policy of the State of Washington to maintain the highest possible standards to insure the purity of all waters of the state consistent with the public health and public enjoyment thereof. Furthermore, it is the public policy of Washington State to combat oil spills in Washington State waters through prevention and preparedness. Chapter 90.48 RCW charges the Washington State Department of Ecology with the authority for supervising the removal of oil spills occurring in state waters; for coordinating state, federal, private industry, and public responses to oil spill cleanup projects; and for conducting surveillance on oil spill cleanup activities that occur in waters of the State. The Department of Ecology has recently initiated a field type oil spill prevention program by employing two oil pollution control inspectors. These investigators will conduct oil handling facility inspections where they will observe procedures employed in transferring oil. They also will inspect for faulty equipment and look for potential oil spill hazards. Their reports and recommendations will be delivered to the Olympia Office where a copy will be forwarded to the owner of the facility. Contingent on adequate funds, the Department of Ecology intends to expand its Oil Spill Abatement Program.

The Oil Spill Action Plan also includes an oil spill classification model designed to provide field investigators with a consistent method of rapidly classifying an oil spill as minor, moderate, or major and a communications

network that includes 16 units of equipment involving portable walkie talkies, a 21 ft inboard-outboard with a 30 watt transceiver and two Dodge van type vehicles, each equipped with a 100 watt transceiver. State and federal coordination regarding oil spills in navigable waters of Washington State is excellent and an efficient notification network is in operation between state and federal agencies.

The State of Washington is in charge of all oil spill cleanup projects. If the cleanup project is being supervised by the state and the effort is within their capability, no further input on the federal level will be implemented except by request.

Under enforcement, an oil spill violator is burdened with unlimited liability for damages, both public and private, resulting from an oil spill incident. He also has strict liability for total cleanup of the spilled oil and he is subject to a penalty of up to $20,000.

Section 1000 of the State Action Plan includes the support programs that are so essential to a comprehensive plan of this nature. Among these are instructions for oil disposal, a materials and equipment inventory, a program set up by the State Game Department for handling oil contaminated animals, and a post spill damage assessment program prepared by Dr. Herbert Webber of Western Washington State College, Bellingham, Washington. Also included are maps of environmental critical regions and the water current regime in Puget Sound.

12. "Environmental Protection Agency's Oil Pollution Control Responsibilities and Programs for Puget Sound," presented by MR. ROBERT BURD:

The Environmental Protection Agency's policy, as stated in the Federal Oil and Hazardous Material Pollution Contingency Plan, is to take corrective action only for those spills which are beyond the capability of the state and local governments and private parties concerned. We agree that oil pollution control is the primary responsibility of the state and we think that the State of Washington probably has the best water pollution control laws of any of the 50 states.

It should be recognized that the Environmental Protection Agency serves a supporting and advisory role in the prevention of and response to oil pollution problems in Puget Sound. The agency has the basic charge of providing technical assistance. In simplified terms, EPA acts as the lead federal agency to regulate against oil spills on "inland waters" and from "nontransportation sources." EPA's direct responsibilities include the following:

(1) Determining quantities of oil discharge that will be harmful to the public health or welfare.

(2) Identifying dispersements and other chemicals that may be applied during an oil spill incident.

(3) Identifying imminent and substantial threats to public health and welfare from an actual or potential oil spill.

(4) In consultation with the Coast Guard, EPA has the responsibility for issuing prevention regulations covering the discharge of oil from nontransportation related onshore and off-shore facilities.

EPA's indirect responsibilities include:

(1) Regional contingency planning
(2) Subregional or state-local contingency planning
(3) Survey of nontransportation sources
(4) National research
(5) Environmental impact statements and federal activities coordination
(6) Federal industrial waste discharge permit issuance

This year EPA's major efforts will include:

(1) Inventory of storage facilities
(2) Establishing review and inspection programs for such facilities
(3) Providing advice on fail-safe design concepts for oil handling facilities
(4) Providing assistance to federal activity programs in the development of prevention programs and federal facilities
(5) Promulgating contingency plans and appropriate regulations
(6) Supporting special studies associated with oil discharges
(7) Responding to spills in cooperation with other federal and state agencies

It is our hope, however, that the joint federal-state prevention programs will make response to oil spills an obsolete activity.

13. "Coast Guard Pollution Responsibilities and Programs" presented by REAR ADMIRAL McCLELLAND, CDR, Thirteenth Coast Guard District, Seattle, Washington:

Coast Guard activity in protecting the marine environment is classified under three major headings: (1) Prevention; (2) Detection and Response; and (3) Enforcement.

The Coast Guard is increasing emphasis on preventing pollution. Regulations have been proposed pursuant to Section 11 (j) of the Water Quality Improvement Act of 1970 and should be in effect by April 1973. These regulations deal with the methods of transporting oil and hazardous substances on vessels and with dock-side procedures at shore terminals. They apply both to equipment and personnel competence. Several of the programs are undergoing modification as they are carried out. The Coast Guard has just completed a 6-month pilot program to closely monitor petroleum transfer operation. The purpose of the project was to evaluate the adequacy of petroleum transfer equipment, transfer procedures, and qualifications of personnel who perform the transfers.

In another effort, the Thirteenth Coast Guard District undertook a project to provide a marked, deep-draft channel clear of submerged obstructions in the San Juan, Haro, and Rosario Straits to facilitate safe transit of deep-draft tankers, up to 60 feet, to the Ferndale - Cherry Point area. The channel project will lessen the threat of oil tanker groundings.

Another effort on Puget Sound in which we are engaged is the development of a vessel traffic system. In the initial stages, the system will be advisory rather than mandatory. This system will incorporate buoy lanes for separation of vessel traffic and a VHF-FM communications network to provide navigational information to ship traffic. The first step toward implementation has been taken with the letting of a contract for the necessary transceivers and micro-wave relays. The VHF sets will be placed on Mt. Constitution (Orcas Island), Green Mountain near Bremerton, Bohokus Peak near Neah Bay, and the

KING Tower on Queen Anne Hill, Seattle. The communication center will be at our Captain of the Port Office at Pier 90, Seattle, and there will probably be an alternate at Port Angeles. The buoy lanes, as now planned, would be 1,000 yard channels in each direction with a 500-yard buffer zone between them. The final shape this traffic management system will take is not yet determined. It is the intent of this system to reduce to a minimum the probability of an accidental discharge of oil.

Under the Coast Guard Detection Program during the calendar year 1971, 201 spills were reported or discovered in Puget Sound. Approximately one-half million gallons of petroleum products were spilled. Eleven spills accounted for 99%, of which three spills accounted for 95% of this amount. Although there has been a substantial increase in the number of reported spills since 1969, there is no reason to believe that the actual number has increased. In fact, the Coast Guard believes that real progress is being made in reducing the number of spills that occur.

The Coast Guard conducts regular surveillance patrols in heavy industrial areas and plans for increased air and water borne surveillance patrols this year. A research and development project is in progress to develop remote sensors for detecting oil spills. To overcome the limitations of visual detection, our research and development program is concentrating on airborne sensors. We hope that new infra-red and ultra-violet sensors will be operational this fall. The Coast Guard is responsible for planning the coordinated and integrated federal response to pollution spills within the coastal zone of the United States. The Captain of the Port, Seattle, is the predesignated Coast Guard On Scene Commander as far south as Point Grenville. The Captain of the Port, Portland, is the predesignated On Scene Commander for spills occurring in the Columbia River west of Bonneville Dam and north along the Washington coast to Point Grenville. The On Scene Commander receives reports of oil spills and initiates immediate actions for containment and cleanup.

The Coast Guard is developing an air deliverable anti-pollution transfer system called ADAPTS. ADAPTS will provide a means for fast, controlled removal of oil from damaged or grounded ships at sea. The system consists of portable pumps, oil storage containers, transfer piping, and necessary fittings and tools--all to be stored at the Coast Guard Air Station. In the event of a tanker grounding, the components would be air lifted to the scene along with operating personnel. Fabrication of the system prototype began in March of 1969. The first full test was run in February 1970 with testing continued through May 1971. Delivery of the first operational system is scheduled for the latter part of this year.

Under enforcement, the leading federal agency for enforcement of Maritime Laws is the Coast Guard, and as such has been concerned with pollution since the Refuse Act of 1899. Additional legislation in 1924, 1961, 1969, and 1970 has increased the Coast Guard's authority and responsibility. Unquestionably, the law that most affects the Coast Guard is the 1970 Water Quality Improvement Act. Under this law the Coast Guard issues regulations to prevent oil spills, receives notification of oil discharges into the navigable waters of the United States, removes oil when the spiller cannot be found or does not clean up properly, enforces criminal and civil

sections of the law, and assesses civil penalties. It is the U.S. Coast Guard's intention to vigorously and aggressively pursue anti-pollution enforcement efforts under the applicable laws and regulations. When the responsible party for a discharge is determined, the U.S. Coast Guard will use its enforcement authorities which should be brought to bear in the circumstances. The U.S. Coast Guard will consider civil penalties against employee or employer, criminal penalties against culpable parties, or administrative procedures toward revocation or suspension of licenses, and merchant marine documents on the grounds of negligence or incompetence. In short, the U.S. Coast Guard will give positive and continuing stress to appropriate enforcement measures designed to protect the environment.

At the federal level the National Environmental Protection Act and the Water Quality Improvement Act are landmarked pieces of legislation. Here in Washington the legislature has enacted a Comprehensive Pollution Control Law. Federal and State agencies both have responsibility upon waters of joint jurisdiction and these responsibilities are largely duplicated. We all want government to be efficient. The agencies have agreed, therefore, that on waters of joint jurisdiction the state will exercise primary responsibility for prevention and cleanup of spills when the state has the capability. This does not mean that the Coast Guard is abdicating its responsibility because, of course, we cannot do that. We will be on the scene monitoring and assisting as may be desirable but the state will do the job when it can. This cooperative effort works and it is effective government.

14. The presentation of DR. RICHARD L. LEHMAN, Senior Staff Scientist, Office of Ecology and Environmental Conservation, National Oceanic and Atmospheric Administration (NOAA), Washington, D.C., is summarized below:

Recent estimates by the Coast Guard indicate that the current annual discharge of oil into the world's oceans has reached 6,000,000 metric tons which amounts to 3/10 of 1% of the world's annual production, excluding an enormous contribution from hydrocarbon fallout. The following table puts the problem in perspective:

Sources of Annual Oceanic Oil Pollution

Sources	Million metric tons	Percentage
World oil production	2,000	-
Oil transport by tankers	1,300	65.0
Hydrocarbon fallout into oceans from vaporization of petroleum products	90	4.5
Tankers and tank barges	1.5	-
All other vessels	1.0	-
Seepage from offshore wells	0.5	-
Refinery and petrochemical operations	0.4	-
Highway motor vehicle wastes	1.4	-
Industrial machinery waste oil	0.1	-
Natural seepage into oceans	0.1	

Knowledge of the fate of oil, after it has disappeared from view at the ocean surface, or the fate of hydrocarbon fallout in the ocean is incomplete.

The chronic low level effects of oil, product exposure on phytoplanktor, or other important links in the marine food webs are also unknown.

As a principal environmental agency of the U.S. Government, NOAA is specifically charged with monitoring and predicting the state of the oceans and the atmosphere. Also charged with the conservation and development of marine resources, the agency is well aware of the growing oceanic oil pollution problem and is engaged in a variety of programs designed to meet its responsibilities in this area.

First, NOAA is active in the role of the prevention of tanker accidents and oil spills in the coastal zone and providing emergency services after a spill has occurred. The National Weather Service broadcasts continually, by use of its VHF-FM channel, marine weather information that is updated every 3 hours. In addition to fog, wind, precipitation, and sea state forecasts, these stations also report bar conditions, ice cover, and storm tide and tsunami warnings that are vital to safe tank operation. Equally important in marine accident prevention, the National Ocean Survey (NOS) prepares and makes available for general use, up-to-date nautical charts, tide tables, coast pilots, current tables, and tidal current charts.

The NOAA ship Davidson is scheduled in 1972 to wire drag a deep-draft channel from the Strait of Juan de Fuca to Cherry Point through Rosario and Bellingham Channels to accommodate deep-draft tankers using the terminal facilities at Cherry Point. It will also wire drag to a depth of 90 feet, all areas within the project limits where the chart depth is less than 30 fathoms.

When an oil spill emergency does occur on the west coast, the National Weather Service (NWS) has available radio-equipped mobile camper units that are on call for any emergency requiring local on-scene weather forecast service. Manned by NWS meteorologists, these units provide local weather, wind, and current information to the oil spill control officer. Such a mobile unit and a meteorologist team is available from the Seattle Forecast Office and is on call for direct weather forecast support for oil spill management in the Puget Sound region.

Infra-red scanning may also be provided by the Aerial Photogrammetry Section of the National Ocean Survey.

A second area of responsibility that NOAA shares with other agencies, under the National Environmental Policy Act of 1969, is the critical review of Environmental Impact Statements issued by other agencies to describe their major programs. Because NOAA is a scientific and technical organization with specialists in many areas, our agency has an obligation and the opportunity--by means of our comments on environmental statements--for exerting a significant positive influence on the plans and projects of other agencies. As an example, when the Department of the Interior requested comments on its Trans-Alaska Pipeline Statement this last spring, Commerce Secretary Stans forwarded a detailed discussion and inventory of environmental risks, largely the work of NOAA scientists. NOAA is contributing to a number of such studies, one of which is directly concerned with oil pollution: The CEQ (Council on Environmental Quality) "Super-tanker Environmental Study." As the first substantial input into the tanker study, the NOAA Environmental Data

Service has just issued a document, "Environmental Guide to Seven U.S. Ports and Harbor Approaches," containing detailed information on the tides, currents, temperatures, and the frequency and intensity of storms, fog, and storm waves at the proposed sites for the super-tank port facilities.

The NOAA Office of Sea Grant is funding a variety of research projects on oil pollution. From the beginning, the University of Washington has participated in the Sea Grant Program, being one of the first three institutions to receive institutional support in 1968. The Washington Sea Grant Program is administered by the University's Division of Marine Resources as a statewide program. NOAA is also involved in a number of ongoing research programs that concern the monitoring of biological effects of oil pollution. One of these is the analyzing of baseline hydrocarbon patterns in Puget Sound algae, shellfish, fish, plankton, and sediments using gas chromatograph techniques. These sensitive analyses enable us to monitor petroleum hydrocarbons in fishery products and to delineate the zones of oil contamination near marinas and port terminal facilities.

NOAA, the Maritime Administration, and the National Bureau of Standards have recently established a joint research program to study the scientific relationship between oil spills and marine organisms. The object of this study is to establish a body of knowledge and basic data to determine with some degree of scientific accuracy the maximum permissible level of oil considered to be harmless to the marine environment.

Central to the understanding of the biological impact on any pollutant released into the marine environment is knowledge of its physical dispersion. The NOAA Environmental Research Laboratories are conducting basic research designed to test models of global and regional circulation dynamics to meet the responsibility for accurate monitoring and prediction of the state of the oceans and atmospheres. A part of this effort is currently underway at the Pacific Oceanographic Laboratories here in Seattle where, in a joint program with the University of Washington Oceanography Department, the hydrodynamics of Puget Sound is under study. The information gained by this study will be used to build realistic mathematical models of the detailed surface and subsurface circulation in Puget Sound.

A new development in environmental monitoring of global circulation is remote sensing by earth satellite. From this study, a knowledge of the details of Gulf Stream circulation is now available in close to real time by use of differential infra-red sensing. Transient meanders of the Gulf Stream off of the southeast U.S. coast can have a major influence on the surface transfer of oil slicks.

15. Comments by MR. C. F. MILLER, Chairman of the Washington State Oil Spill Cooperative (WSOSC):

The Washington State Oil Spill Cooperative was organized on 2 March 1971 as a cooperative of the 10 oil companies using the navigable waters of Washington State. The purpose of the Cooperative is to develop a procedure among companies for mutual assistance and cooperation in the control of oil spill emergencies occurring in Puget Sound and along the coast of Washington State. The procedure will make available to member companies, or to authorized governmental agency for nonmember third party use, materials and equipment in the event of an emergency.

It is the intent of the Cooperative to own materials and large oil spill containment and cleanup equipment that would otherwise be uneconomical for individual member companies or oil spill cleanup contractors to own. To this end the Cooperative has available expert advisors within the member companies. These experts are knowledgeable in the various areas of oil spill technology and will be available as a nucleus organization to aid in large spill containment and cleanup operations.

The 10 member companies of the Cooperative have refineries or terminals in the navigable waters of Puget Sound. These member companies are: Atlantic Richfield, Mobil Oil, Phillips Petroleum, Shell Oil, Sound Refining, Standard Oil of California, Texaco, Time Oil, Union Oil of California, and U.S. Oil and Refining Company. The full time Cooperative Manager is Mr. John Doolittle who is on loan from the Shell Oil Company. His office is in Mount Vernon, Washington. The Cooperative holds monthly meetings in Seattle and committee meetings as necessary.

The refinery and terminal of each member company will have equipment and contingency plans to contain and clean up minor oil spills. This equipment will also be available during an oil spill incident to any other member company or to a nonmember company when requested by an authorized government agency such as the U.S. Coast Guard, EPA, or the State Department of Ecology. For instance, the ARCO refinery at Cherry Point owns two 18-ft purse seine boats, 2,500 ft of containment boom, and a portable trailer mounted Huskey Jr. skimmer. At the Shell Harbor Island terminal, immediately available on site, are 600 ft of boom, a portable Swiss skimmer, and an 18-ft outboard work boat. In addition to the equipment owned and stockpiled at the individual company facilities, the Cooperative has and will purchase large expensive equipment to be used by all concerned should a large oil spill occur.

The WSOSC owns 1,000 linear ft of 6-ft deep off-shore Bennett boom and a 40-ft long Huskey skimmer. The boom will be stored on a company owned barge. The barge will be moored at the north terminal of the Port of Bellingham. The skimmer will be located alongside, and the complete system will be ready to be towed by tug to an oil spill site. The oil recovery system will be operated by specially trained men provided by an independent contractor. If only the skimmer is required, it can be readily loaded on two flat bed trucks and hauled to the oil spill site. This containment system can operate in 4-5 ft waves and will pump 1,800 gallons per minute of oil or oil-water mixture.

WSOSC plans to provide a coordinated communication system to cover the entire west coast with a network using a common radio frequency. In this manner the five operational cooperatives on the west coast can stockpile and share much common radio equipment. These cooperatives are located in Los Angeles, Santa Barbara, San Francisco, Portland, and Puget Sound.

The WSOSC Oil Spill Response Manual has recently been updated and revised. The Response Manual also contains the Cooperative's Oil Contingency Plan. Basically the Cooperative does not clean up oil spills. This is the responsibility of the spiller. The Cooperative, however, will provide large oil spill equipment and materials as well as preselected and trained advisors if requested. Actual cleanup will be accomplished through independent contractors with trained operators such as the Marine Oil Pickup Service.

Future activities of the Cooperative will include additional equipment selection and purchase, continual training, sea trials of equipment, and coordination and development of oil recovery capability with contractors in governmental agencies.

Since 1967, 67 Oil Spill Cooperatives have become operational in the United States with another 22 in the development stage. A measure of the oil industry's accelerating interest in this area is in the fact that in 1971 alone, 25 of these 67 Cooperatives became operational. The oil industry has the interest and the resources; it has shown the willingness to protect the water environment which is so necessary to its transportation needs.

16. The last paper of the morning was presented by REAR ADMIRAL KEN AYRES of the Northwest Towboat Association:

The three member companies of the Northwest Towboat Asociation that transport petroleum products on Puget Sound have a total of 230 years in the towing business. The youngest of the three was founded in 1901, over 71 years ago. The owners and operators of these companies are responsible people who realize the obligation that they have toward the community as well as the contribution they are making to it.

Since 1918, petroleum transportation by barge has played a vital role in the development of the Puget Sound Basin which now contains two-thirds of our State's population. We are making a significant contribution to its economy.

Fifty years ago, nearly every little hamlet or industry on Puget Sound received its oil by tug and barge. There was no other way. Nearly all these points of delivery that were served for so many years are gone and in their place are fewer but larger and more efficient terminals. There still are many island areas today that receive oil by barge, which is the only practical method. The movement of petroleum products in large volume by barge provides the flexibility that permits almost immediate response to severe temperature changes which cannot be had by pipeline, tank truck, or rail tank car. Water transportation has provided a low cost means which results in lower product costs to the consumer.

In the past 54 years the towboat industry has had only two oil spills that exceeded 5,000 barrels each. During this same period we have safely moved more than 500 million barrels of petroleum products. In 1971 we had our worst oil spill in history and still handled more than 18 million barrels of oil safely. The spill amounted to less than 2/100 of 1% of the total volume safely handled. The three member companies referred to move approximately 2 million gallons of petroleum products per day. According to the State Department of Ecology records, our industry was charged with six oil spills during 1971. The July issue of the Audubon Magazine stated that only 2% of the oil spills upon the waters of the world have been caused by accidents of cargo ships, tankers, and barges.

Our member companies are continually striving to completely eliminate accidental oil pollution. Any oil spill in the towing industry is an accident caused by human error or mechanical failure. We have no such thing as built-in or intentional pollution. Oil barges under tow are always under the supervision of a Coast Guard licensed crew member. Our companies hold periodic meetings of tankermen to review procedures, rules, and regulations; we conduct retraining programs. We also use tankerman checkoff sheets before oil transfers begin.

We equip our barges with the best safety devices available such as engine alarms, pressure gauges, double block valves, flood lights, pressure relief valves, warning signs, drip pans, insurance wires, etc. At present we are studying the use of electronic indicators. The industry also has invested in a wide variety of oil spill containment and cleanup equipment including booms, skimmers, special tools, and absorbents. We are continuing to investigate new products and new equipment. In addition, our industry has bridge-to-bridge voice communication between our tugs, the Puget Sound Pilots, and the State Ferries for nearly 2 years, although the federal law requiring this has just been passed and is not yet put into effect. At a recent meeting of the Washington State Pilotage Commission, one of the more respected pilots stated that the towboat industry has always been a leader in the implementation of new navigational equipment which lessens the chance of an accident and an oil spill.

The towboat companies on Puget Sound have led the way in the spirit of cooperation, joint use of equipment, and know-how. We are pledged to help one another with equipment and personnel as required in the case of a spill.

The condition of Puget Sound is good. A few years ago bilges were pumped into Puget Sound and dirty ballast tanks were pumped into Puget Sound, but not anymore. Intentional oil pollution is a thing of the past and accidental spills are now cleaned up.

There are 17 state and federal agencies regulating or monitoring the towing industry. The Coast Guard as an enforcement agency for the federal government in marine matters blankets us with a mountain of regulations from vessel construction to operational procedures. They license, inspect, and investigate very thoroughly. The Coast Guard is writing proposed regulations concerning the design of our barges and tugs and procedures to be used when transferring oil. In addition to this, the Coast Guard is now monitoring selected oil transfers of 1,000 barrels or more. At the opening of this Session of the U.S. Congress, 43 bills were in the hopper, all of which if passed would affect our industry one way or another.

These together with the aquaculturalists, the gillnetters, the commercial crab fishermen, and the sailboat racers are beginning to give us a slight understanding of how General Custer felt that morning on the hillside above the Little Big Horn in eastern Montana.

DISCUSSION

A discussion followed presentations by the panelists.

Section V. Panel--Puget Sound and the Alaska Oil Development
(1:20 PM, Thursday, 24 February 1972)

Moderator: RALPH J. STAEHLI
Manager, Puget Sound Sales
Foss Launch and Tug Company
Seattle, Washington

Rapporteurs: HARRY B. TRACY and JOHN C. BERNHARDT
Biologist and Aquatic Biologist
Washington Department of Ecology
Olympia, Washington

17. TOWARDS ASSESSING THE ALASKA IMPACT ON PUGET SOUND

by

DR. STEVEN H. FLAJSER
Research Associate
College of Engineering
University of Washington
Seattle, Washington

The proposed Trans-Alaska pipeline and its subsequent impact on Puget Sound clearly demonstrates that decisions in one area of our society have direct consequences for others. Perceiving that a potential problem exists and taking stock of where we are in regard to the environmental hazards and prevention, containment, and cleanup of spills is the inquiry of this conference. Yet the public interest and those of future generations must be served through looking ahead and beyond to determine what the benefits and costs this and subsequent petroleum developments will have.

The National Environmental Policy Act of 1969 set the pattern by (1) placing the burden of proof on those who would alter the environment to show that their action would have greater social benefit than cost, (2) requiring anticipatory thinking rather than post-facto reaction, and (3) requiring consideration of alternatives. This can only be done through the cooperation of many groups exchanging information in the public arena.

Certain matters concerning the Alaska pipeline and oil development need clarification and assessment:

(1) How much oil will be coming to Puget Sound and adjacent waters via tanker?

Washington is totally dependent on outside sources for oil--we now receive crude oil by pipeline from Canada (90%) and tanker (10%) in addition to trucked-in refined products. With increase in demand, refinery capacity grows, such as the ARCO facility at Cherry Point which will be serviced by one to two 120,000 DWT tankers weekly carrying Alaskan crude. If, as some statements indicate, this supply will be quite sufficient for near future demands, why do some public officials project that this region will become a superport area, and second, why are there proposals to mark 89-90 ft channels beyond the 60-ft channel--recalling that 250,000 DWT tankers (with drafts of 65 ft) cannot be presently handled elsewhere on the West Coast? Likewise, projections for peak production indicate a surplus in 1980 of 500,000 barrels per day. Under these conditions of our natural deep harbors and the potential of surplus oil from the present and future Alaskan fields, will this become a trans-shipment region? If increased amounts of water-transported oil to this area occur, quite serious economic and environmental consequences will arise.

(2) What are alternative sources of oil?

Leaving aside the broader question of energy alternatives, what restrictions are this region under as to source and means of transported oil? There is a possibility of foreign tanker shipments, though perhaps less acceptable due to the poorer safety record of foreign flag vessels. More viable yet is the import of Canadian oil. This overland source presently serves the area. The Oil Import

Quota System would not restrict increased Canadian crude to meet demand. As our northern neighbors likewise exploit their resources, the barrier to increased import seems to be mainly a problem of engineering. Will the price of gasoline to the consumer in Washington actually differ if this area is supplied by Canadian vs Alaskan crude? Regardless of source and volume of incoming oil, the locations of future refineries is a vital question. The potential of siting on Washington's coast rather than inland has not yet been analyzed.

(3) What are the environmental hazards of oil pollution?

We do not live in a zero-risk world, so as a whole we must determine how clean is clean or how safe is safe. Great debate still exists over the effects of petroleum on the marine environment, but sufficient evidence indicates the potential for long-term damage. With economic, time, and baseline information restrictions, can science provide the public with answers as to short- vs long-term and lethal vs sublethal effects, hazards to marine life vs risk to human health? Would a prototype spill provide significant information? Most important, how can we internalize all costs in achieving a true damage assessment?

(4) What are the economic benefits to be accrued from Alaskan oil development?

Much publicity has been given to the supposed economic benefits to Puget Sound from Alaskan oil. Will the benefits be a long-range stimulus to the economy or only persist during the construction phase? The question of benefits vs costs has yet to be assessed, taking into consideration all the parties affected. The situation is one of competing uses of a resource (the coastal zone and water) with risks to the marine environment, fishing interests (both sports and commercial are renewable resources dependent on clean water), aquaculture effects, recreational boating, second home (real estate values), and tourist trade, not to mention esthetics. The oil industry is highly automated and not labor intensive, and thus debate exists whether future state income would be benefited by the industry's increased marine operations on Puget Sound.

In looking towards the future, many unanswered questions exist. With environmental consequences of oil pollution not yet determined, contingency plans only on paper, cleanup technology not always effective, potential hazards to other industries open, costs rising through both procurement of technologies and burden on institutional time, decisions can only be reached in the public arena through complete disclosure of benefits, costs, and alternatives.

18. PROJECTED FEDERAL LEGISLATION AND CONTROLS ON OIL AND HAZARDOUS MATERIALS

by

KENNETH E. BIGLANE
Director, Division of Oil and Hazardous Materials
Environmental Protection Agency
Washington, D. C.

Environmental water pollution legislation at the federal level evolved slowly until the Torrey Canyon and Ocean Eagle oil spill incidents in 1967 and 1968 convinced the United States government of the need for new legislation. Sections 11 and 12 of the Water Quality Improvement Act of 1970 were a significant step toward achieving this goal. Section 11 deals with "control of pollution by oil" whereas section 12 is concerned with "control of hazardous pollution substances." Section 11 in particular was one of the most ambitious and successful pieces of legislation ever passed through Congress dealing with water pollution. Not only does it provide specific guidelines, it has brought the various involved federal government agencies together on the problems and initiated contingency planning by state agencies. Furthermore, coordination between the various levels of government and industry and the general public is a must to adequately cope with "unscheduled discharges" of oil and hazardous materials into offshore and inland waters of the United States.

In looking ahead to 1972, the 1971 legislation incorporates sections 11 and 12 of the 1970 Water Quality Improvement Act, giving hazardous materials the same sanctions as oil. The government had been concerned that many hazardous materials could not be cleaned up in the standard sense. The new legislation also proposes to add "tributaries thereof" to the previous legislation which was limited to navigable waters. In addition, an unlimited entry concept is being developed for all areas of the country authorizing government administrators or representatives with the right of entry to, upon, or through any source of effluent; to sample any effluent; look at any records; or check any monitoring equipment in dealing with water pollution incidents.

Two recent pollution incidents directly related to the new legislation are examples of the present trend. The first incident occurred in North Carolina when a warehouse storing pesticide chemicals was destroyed by fire. The water used to extinguish the fire, plus the stored chemicals, were drained from the warehouse to a nearby waterway, and procedures were subsequently implemented to clean up the pollutant. The second incident occurred in Ohio when an irate citizen dumped a chlorine combination chemical into a lake, resulting in a fishkill. Cleanup included a filtering system at the lake outlet and restocking of the fish population.

In summary, Congress has come a long way in dealing with water pollution and is still very much concerned with the problem. The groundwork has been set for the regulatory agencies, which should now proceed accordingly. The possibilities are endless.

19. RESTRUCTURING OF STATE AND FEDERAL GOVERNMENT PROCESSES

by

DR. DONALD W. HOPPS
Executive Assistant
Puget Sound Governmental Conference
Seattle, Washington

In place of his scheduled presentation "Local Regulations, Responsibilities, and Port Activities," DR. DONALD HOPPS elected to contribute "a plea for restructuring of state and federal government processes so that local governments can begin to approach more responsibly the programs and opportunities the Alaska Oil Development means to this region":

The important concept of change may be defined as something bound to occur under the pressure of forces which impel movement; government change occurs as the apparatus moves to meet external problems which must be resolved. Furthermore, change includes a mechanical factor in that change at one level of government necessitates reciprocal changes throughout the entire government structure. In reference to the many problems that confront government, the various agencies must change to meet and solve new problems as they appear.

A lack of adjustment by government to meet new problems was apparent at a recent Puget Sound Governmental Conference. When local officials from Alaska, Oregon, Idaho, and Washington were asked to present statements concerning the most pressing problems facing their governments, the overwhelming response was "our problem is intergovernmental relations."

The response in Washington State to problems such as the Alaska Oil Development has been substantive; that is, the standard response has been a new program or, in lieu of a new program, new policy directives. In any event, new programs or new policies have usually been translated into new studies. The new Shoreline Management Act is a case in point in that it sets forth policies and guidelines for the protection of this important environment resource but makes patchwork of intergovernmental relations. This is not to gainsay new policies and programs but to show that a great part of the change taking place in Puget Sound is functional in that government is being asked to undertake new, even more complex duties and responsibilities. The new responsibilities are determined directly by the problems which have given them definition; little heed has been paid to the system itself, however, despite the many complaints raised with respect to it.

We have been quick to devise new approaches to problems but have been slow to build new kinds of government vehicles to carry through with these approaches. The words "new kinds" are emphasized in that there has been little hesitation in building more new, old kinds of governmental vehicles. In developing our approach to the grave problems which we face, we have enveloped ourselves with even greater governmental complexity, the very seat of inefficiency and insensitivity.

We should focus our efforts on bringing about needed changes in the structure of intergovernmental relations. We need not so much new policy dictums as a means to define coherent policy. Furthermore, coherent policy must be developed on the same scale in which the problems occur--on the level of the neighborhood, the metropolitan region, and the interstate region. Scope is only the first test of relevance. Whatever we build to the scale of the problems that beset us, it must have the power to see to the execution of the programs we devise to meet the problems.

The basic need in this region and elsewhere is that we take control of the process of government change that has overtaken us. If we fail to do this, all the good intent of new policies and new programs will be undermined and rendered ineffective by our too cumbersome government structure.

To achieve our goals, we should first establish a rational government framework. We must realize that our present government structure is based on a society of farms and small towns. We are no longer that society. We must develop a framework which in its flexibility is more in harmony with our complex society. It is our responsibility to direct governmental change to this end if we are to deal effectively with changes the Alaska Oil Development promises to bring about in Puget Sound.

DISCUSSION

A discussion followed presentation by the panelists.

Section VI. Coordinated Local Operational Activities, Summary

(3:30 PM, Thursday, 24 February 1972)

Moderator: JAMES P. BEHLKE
Executive Assistant Director
Washington Department of Ecology
Olympia, Washington

Rapporteurs: HARRY B. TRACY and JOHN C. BERNHARDT
Biologist and Aquatic Biologist
Washington Department of Ecology
Olympia, Washington

Panelists:

20. DR. WALLACE G. HEATH
Director, Lummi Aquaculture Project
Marietta, Washington

21. JAMES C. WILLMANN
Chief, Environmental Emergency Section
Environmental Protection Agency
Seattle, Washington

22. HARRY B. TRACY
Biologist
Washington Department of Ecology
Olympia, Washington

23. LCDR LOREN D. GORDON
Chief, Intelligence and Law Enforcement
13th Coast Guard District
Seattle, Washington

24. W. JACK RACINE
Refinery Manager
Atlantic Richfield Co.
Ferndale, Washington

25. BARRY J. PAULSEN
MOPS Coordinator
Marine Oil Pick-up Service
Seattle, Washington

For the final session of the Oil Pollution Symposium, the six panelists each presented a short introductory talk on their interests in the problems associated with oil in Puget Sound. After completion of the presentations, the audience was invited to ask the panelists any questions pertaining to their respective areas of interest.

20. The first speaker, DR. HEATH, reviewed "Some of the Problems with Oil Pollution in Puget Sound as Related to the Lummi Indian Aquaculture Project." Particular reference was made to insufficient reaction time of his staff in the event of a spill at or near the new Cherry Point Refinery. Dr. Heath stated that "if the wind and current were right, it would take only about 2 hours for spilled oil to reach his project—not enough time for total prevention." He did not feel that the responsibility for oil cleanup equipment was his but was that of the State or industry. Dr. Heath went on to say that "aquaculture has good economic potential in Puget Sound and deserves far greater attention in relation to oil spills than it now receives."

21. JAMES WILLMANN briefly discussed "State and Federal Contingency Planning and Some of the Problems Involved." Communication was cited as a major problem, and he explained that the Environmental Protection Agency is tying into the USCG communication system via teletype. Mr. Willmann also pointed out that research needs often develop during an oil spill incident, and EPA has the ability to meet these needs through emergency contract capabilities. The EPA program is also directed toward prevention of oil spills in cooperation with local, state, and federal agencies.

22. HARRY TRACY outlined the "Action Phase of the Oil Spill Action Plan" developed by the Washington Department of Ecology. According to Mr. Tracy, in the basic plan the Regional Manager initially investigates all oil spills. If the spill is classified as minor, it is processed to completion at the regional level. If the spill is classified as moderate or major, the Oil Spill Supervisor (OSS) in Olympia is notified who, in turn, dispatches an oil spill investigation team for verification of the spill, notifies the violator of his rights, and alerts all concerned parties that a serious oil spill has been reported. When the spill is verified as moderate or major and the responsible party is willing to initiate cleanup, the OSS sets up an office at or near the spill location to monitor cleanup progress and coordinates surveillance and communication activities regarding the spill until cleanup is completed. If the violator is unknown or unwilling to clean up the spilled oil, OSS will also accept cleanup responsibilities using the Coastal Protection Fund.

23. The fourth participant in the final session, LCDR L. GORDON briefly outlined his "job as Chief of Intelligence and Law Enforcement for the 13th Coast Guard District" which includes Alaska, Washington, Oregon, and Idaho. Mr. Gordon elected to not give a presentation but to entertain questions from the audience later.

24. MR. JACK RACINE of ARCO described some of the "Programs at the Cherry Point Refinery" to provide optimum environmental protection. Mr. Racine explained that the dock facility is shaped to help contain spilled oil and has a number of safety devices such as electric shut-off valves, check-off lists for employees, and night lighting. Cleanup equipment includes skimmers and a containment boom which is out during all transfer operations. Personnel are sent through an educational oil spill prevention program. In addition, the refinery has a two-stage waste plant for treatment of waste water. These wastes are continuously monitored for effect on aquatic life. To date "well over $350,000 has been spent by ARCO on environmental studies," according to Mr. Racine.

25. The final talk of the Symposium was given by BARRY PAULSEN who reviewed the "Response Plan" of the Marine Oil Spill Pick-up Service (MOPS). Mr. Paulsen described MOPS as a joint venture of Puget Sound Tug and Barge, Pac-Mar Services, and Marine Power and Equipment Company. Headquarters are at Pier 17 on Harbor Island in Seattle. According to Mr. Paulsen, MOPS has various supplies distributed throughout Puget Sound and can draw upon up to 175 people to combat oil spills in the Puget Sound Area.

DISCUSSION

A discussion followed presentation by the panelists.